

**Notice of Allowability**

Application No.

10/507,432

Applicant(s)

BAUER ET AL.

Examiner

Ling-Siu Choi

Art Unit

1713

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Amendment after Final filed 04/26/2006.
2. ☒ The allowed claim(s) is/are 41-44, 47-49, 51, 53, 55, 73-82, 87 and 88.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

### **DETAILED ACTION**

1. This Office Action is in response to the Response and Amendment after Final filed April 26, 2006. Claims 1-40, 45-46, 50, 52, 54, 56-72, and 83-86 were canceled and claims 41-44, 47-49, 51, 53, 55, and 73-82 are now pending.

#### ***Examiner's Amendment***

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CAR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Ms Tanya E. Harkins on May 23 and 24, 2006.

3. The application has been amended as follows:

In Specification, page 8, line 18 just above the line beginning with Figure 1, insert a subtitle reading **"BRIEF DESCRIPTION OF THE DRAWINGS"**;

In Specification, page 8, lines 14-16, moving the whole paragraph reading "The following examples have the purpose of facilitating the understanding of the invention, and do not intend to limit in any manner its scope, which is solely defined by the appended claims." to the end of the page 8 after the line beginning with Figure 9;

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Claim 41, lines 16-17, change "said the particles are presented in mixtures of large and small dies and" to --the particles--;

Claim 55, lines 4-5, change "by the use of a non-solvent, preferably water." to --by the use of a non-solvent. --;

Claim 73, lines 4-5, delete "of the general formula  $Zr(O_3POH)_{2-x}(O_3P\_Ar)_x$ , wherein  $0 < x \leq 2$ ,";

Claim 73, lines 15-16, change "said particles are presented in mixtures of large and small dies and" to --the particles--;

Claim 82, lines 4-5, change "by the use of a non-solvent, preferably water." to --by the use of a non-solvent.--;

**Add the following claims:**

--87. (New) The method for the preparation of the proton conducting composite membrane material according to claim 55 wherein the non-solvent is water.--;

--88. (New) The method for the preparation of the proton conducting composite membrane material according to claim 82 wherein the non-solvent is water.--

***Allowable Subject Matter***

4. Claims 41-44, 47-49, 51, 53, 55, 73-82, 87-88 are allowed.

5. The following is an examiner's statement of reasons for allowance:

The present claims are allowable over the closest references: Grot et al. (US

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5,919,583) and Bonnet et al. [Journal of New Materials for Electrochemical Systems, **3**, 87-92(2000)].

A method for the preparation of a proton conducting composite membrane material:	
A	preparation of layered particles of zirconium phosphate $[\text{Zr}(\text{O}_3\text{POH})_2]$ or zirconium phosphate sulfoarylene phosphate in the form of a mixture of small and large dies by exfoliation of the phosphates in aqueous solution by intercalation-deintercalation of an alkylamine
B	preparation of a colloidal dispersion of the layered particles in a suitable organic solvent or mixture of organic solvents
C	transferring of the layered particles from the colloidal dispersion to a solution of a polymer by mixing
D	forming membrane materials with oriented particles by using the obtained mixture and eliminating the solvent
wherein the particles are exfoliated to a thickness from ca. 5 nm to 100 nm	

(summary of claim 41)

A method for the preparation of a proton conducting composite membrane material:	
A	preparation of layered zirconium phosphate sulfoarylene phosphate in the form of a mixture of small and large dies by exfoliation of the phosphates in aqueous solution by intercalation-deintercalation of an alkylamine
B	preparation of a colloidal dispersion of the layered particles in a suitable organic solvent or mixture of organic solvents
C	transferring of the layered particles from the colloidal dispersion to a solution of a polymer by mixing
D	forming membrane materials with oriented particles by using the obtained mixture and eliminating the solvent
wherein the particles are exfoliated to a thickness from ca. 5 nm to 100 nm	

(summary of claim 73)

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Grot et al. disclose a method to prepare a cation exchange membrane, comprising the contact of a polymer having cation exchange groups and an inorganic filler, wherein the inorganic filler can be phosphate of zirconium such as zirconium hydrogen phosphate  $[\text{Zr}(\text{HPO}_4)_2]$  (abstract; col. 6, lines 13-14; col. 7, lines 4-24). Attention is drawn to Example 1, wherein the inorganic filler is prepared by precipitation in situ in the polymer (col. 7, lines 4-7). Thus, Grot et al. do not teach or fairly suggest a method to prepare a proton conducting composite membrane material having oriented particles, comprising the contact of layered particles of zirconium phosphate or zirconium phosphate sulfoarylene phosphate in the form of a mixture of small and large dies [ca. 5 nm-10nm] by exfoliation of the phosphates in aqueous solution by intercalation-deintercalation of an alkylamine and a polymer.

Bonnet et al. disclose a method to prepare a hybrid organic-inorganic membrane for a medium temperature fuel cell, comprising the contact of zirconium phosphate sulfophenylphosphate  $[\text{Zr}(\text{HPO}_4)_{0.5}(\text{O}_3\text{PC}_6\text{H}_4\text{SO}_3\text{H})_{1.5}]$  or  $\text{Zr}(\text{HPO}_4)(\text{O}_3\text{PC}_6\text{H}_4\text{SO}_3\text{H})$  and zirconium phosphate  $[\alpha\text{-Zr}(\text{HPO}_4)_2 \cdot \text{H}_2\text{O}]$  and sulfonated polyetheretherketone (abstract; Table 1). However, Bonnet et al. do not teach or fairly suggest a method to prepare a proton conducting composite membrane material having oriented particles, comprising the contact of layered particles of zirconium phosphate or zirconium phosphate sulfoarylene phosphate in the form of a mixture of small and large dies [ca. 5 nm-100nm] by exfoliation of the phosphates in aqueous solution by intercalation-deintercalation of an alkylamine and a polymer.

In light of the above discussion, it is evident as to why the present claims are

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patentable over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ling-Siu Choi whose telephone number is 571-272-1098.

If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reach on 571-272-1114.



**LING-SUI CHOI**  
**PRIMARY EXAMINER**

May 24, 2006